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Journal of the Society of Arts.

FRIDAY, AUGUST 1, 1856.

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EXEMPTION FROM RATING.

Owing to the early prorogation, it has been found impossible to carry through both Houses of Parliament, this session, the Bill for amending the law relating to the exemption of Institutions from local rating. The Bill is, therefore, necessarily postponed. It will, however, be re-introduced early next session. From the discussion which has taken place, there appears reason for hoping that the Bill, with certain alterations to meet the views expressed in the House, will then pass into a law. In the meantime, the Bill, as amended, will be printed, in order that the Institutions may have a further opportunity of discussing its provisions and suggesting improvements.

BRUSSELS CONGRESS.

Some confusion seems to have arisen from the circumstance that two International Congresses are shortly to be held at Brussels; the one for improving the physical and intellectual condition of the working classes, to be opened on the 15th September; the other, for promoting the principles of free trade, to be opened on the 22nd of the same month. The object of the latter is to collect, "from every country and every industry,—in one word, from every branch of human activity,—every fact, every information, every law or regulation which may affect, for good or evil, labour in each country, either by hindering or facilitating the exchange of the results of that labour against foreign productions." The other is intended to induce a better knowledge of the actual condition, wants, and resources of the industrial population in various countries, and to encourage the adoption of the most practical means for improving their health and comfort. With this view it will be connected with the Exhibition of articles of domestic and sanitary economy, which is to be opened on the 25th August, and closed on the 5th October.

ON NEGATIVE ARTESIAN WELLS, OR ABSORBING BORED WELLS, AS A MEANS OF DRAINING LANDS, FARMS, BUILDINGS, &c.*

By Augustus Edward Bruckmann, Ph. Dr., Consulting Engineer and Geologist.

(*Continued from page* 612.)

The accurate construction of *positive artesian wells*, and especially the determination whether their establishment under certain conditions and local circumstances is likely to be successful or not, supposes a fundamental knowledge of geology and subterraneous hydrography based on numerous practical observations.* The same degree of scientific and practical knowledge is requisite for establishing negative bored wells, or considerable mistakes will occur and large sums be wasted.

Therefore, if any undertaking is to be made, whether positive or negative, it is of no use to consult mere well-sinkers; for those people in general, know nothing but the particular beds of their respective districts, and only possess some practical knowledge of operating. The following warning fact may throw some light upon this matter:—

Two years ago, a noble landholder invited me to examine his somewhat elevated estate near the town of Leonberg, in Wirtemberg, in order to obtain my opinion on the boring of a positive artesian well, the execution of which had already proceeded to a depth of 265 feet. On examining the spot where the work had been undertaken, near the proprietor's castle, from which a steep slope descended to the bottom of a neighbouring narrow valley, I found the formation there deposited belonged to the upper shelly limestone (muschelkalk). During the execution of this boring, they had cut through partly positive, partly negative strata; once the column of water which was met with rose a little, another time it fell back again to a still greater depth than before, but its level remained always many feet beneath the surface of the soil; for that locality is such that the establishment of a true artesian well could never be successful. The individual undertaking this boring-work belonged to the class of common workmen, had been formerly employed as a day-labourer by a boring establishment, and was entirely ignorant of any geological formations, as well as devoid of any scientific cultivation. He predicted to the landholder a successful termination of the undertaking, and would have continued the work if I had not been called in and stopped the useless perforation, and given other advice. If I had been consulted in due time, that is, before the commencement of this unsuccessful boring, I could have saved the landholder a large sum, and supplied his castle with a stream of drinking-water in another and simpler way.

Thus a negative bored well was here established, capable of taking in and carrying off a vast quantity of superfluous waters, while the intention was to get a positive artesian well.

In England, likewise, deplorable disappointments have been met with in establishing positive artesian wells, and, as it seems, on a larger scale than in Germany and France; thus I find, in the interesting work of Messrs. Swindell and Burnell,* the following passage, pp. 24-25:—

"The existence of causes susceptible of modifying to so great an extent the success of an operation of this kind is not sufficiently known, either to the public in general, or to those who by their professional position ought to be better informed. Unfortunately, the *science* of well-boring does not exist in England, and the execution of this description of work is usually left to mere practical men. The consequence has been, that several wells have been commenced, have given rise to great outlay, and, after disappointing the hopes of all concerned, have been abandoned. It is true that the knowledge of the geological disturbances of strata, often hidden entirely, must be always, to a great extent, hypothetical, but there are indications sufficiently clear to lead any practised geologist to say beforehand whether any disturbance or fault exist likely to compromise the work proposed to be executed. With the most elaborate investigation, and the most extensive knowledge, there is always a degree of chance about the first well bored for the purpose of reaching deep springs in any district. It is not, therefore, surprising that the majority of the attempts hitherto made in our country should have been failures."

As for the deep and unsuccessful boring at Southampton, on the Common, two accounts are to be found in the same work, pp. 25-27, and pp. 88-90, which are so remarkable that I cannot forbear to quote here at least the first of them :—

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* Compare: The "Penny Cyclopædia" of the Society for the Diffusion of Useful Knowledge, Volume II., pp. 412-414, where will be found a short and popular essay on *artesian wells*, the following lines of which correspond with what I have written above:—"It must be apparent from these considerations, that extreme caution is necessary in the choice of situations for sinking to obtain artesian wells, and that general geological knowledge of the country, in which the attempt is to be made, should precede any borings for this purpose, otherwise much useless expense may be incurred, without a chance of success. Indeed, the power of pointing out those situations where artesians wells may, in all probability, be successfully established, is one of the applications of geology to the useful purposes of life."

* Rudimentary Treatise on Well-Digging, Boring, and Pump Work, with Illustrations. London: John Weale, 1854.

"The well at Southampton has afforded also some very important lessons with respect to the disturbances or modifications likely to be met with in the prosecution of such works. It was commenced at a point about a mile and a half from the sea, and 140 feet above the level of the high tides. As too frequently happens, no survey of the entering ground of the green-sand formations was made before commencing it, nor were the disturbances of the chalk strata, the only ones exposed in a manner able to furnish any valuable indications, taken into account. Now it happens that the green-sand ridge is disrupted in several places on the edge of the basin supposed to hold the waters from which the well was expected to be supplied, and important rivers flow away from it at those places, at levels little above the ground at the well. Should a water-bearing stratum exist, therefore, the water can rise very little above the ground, even supposing that all the other necessary conditions be fulfilled. But the whole of this part of the country has been disturbed in a very remarkable manner. A very strongly-marked fault exists in the chalk near Winchester, and continues to the sea shore near Portsmouth. The sea has formed two large breaches in the containing basin of the green-sand on the east and west of the Isle of Wight. At the back of the island the marks of geological disturbance are even more evident than upon the north of Southampton; the strata are contorted, and even tilted up in a vertical direction. The same facts occur also more to the south west, near the Isle of Purbeck, so that there appears little reason to believe that the basin is continuous, and at any rate the sea is in direct communication with the green-sand formations; if, therefore, it do not affect the quality of the water contained in the green-sand, it must regulate the water line, and cause it to take a regular inclination corresponding nearly with a line drawn from the last great inland overflow to the sea water level. But it is found that the water obtained from the chalk itself in the present state of the work is strongly affected by the infiltration through the body of the rock from the sea. If this be the case with a substance comparatively so dense as the chalk, the probability that the same effect will take place with the more pervious materials of the subcretaceous rocks, amounts almost to a certainty.

"Again, in all cases where wells have been sunk to a great distance from the surface, it is known that at a certain point the temperature becomes constant, and that beyond this it increases according to a law susceptible of modification by local circumstances. Mr. Paterson (Edin. New Phil. Mag., 1839) gives the mean rate of increase in Scotland as being about 1° Fahrenheit for about 48 feet of descent. M. Walferdin found in Paris the increase was at the rate of 1.8 Fahrenheit for every 102 feet 10½ inches (or 1 centigrade for 30m. 87.). M. de Girardin found at Rouen that it was about 1.8 for 67 feet 4 inches in one case, and 1.8 for 100 feet descent in another, whilst the more accurate experiments upon the artesian well of Grenelle, show that the increase there is with remarkable regularity, 1.8 Fahrenheit for 106 feet descent below the point of constant temperature, which is about 93 feet 6 inches from the surface of the ground at the Observatory of Paris, and marks a little more than 53° Fahrenheit.* This would give an increase of temperature of about 1° Fahrenheit to 59 feet descent. This important law does not appear to have been much attended to in England, or certainly, as in the case of Southampton, the notion of obtaining the whole supply of the town from a deep-seated artesian well would never have been entertained. The boring has been carried to a depth of 1,320 feet nearly, still in the chalk, so that, even did a supply of soft water exist at that depth, it would have a temperature of nearly 75° Fahrenheit; and as in all probability it would be necessary to descend 250 feet deeper before a copious supply could be obtained, the water from that depth would be about 80° Fahrenheit. From these combined reasons the town of Southampton have been induced to abandon the boring on their Common,—unfortunately not before they had spent a very large sum of money upon a work, which, if a survey of the district had been made by a competent person, would never have been commenced."

The establishment of absorbing bored wells, principally for agricultural purposes, is in many cases not expensive, because the intended purpose "to sink the waters" can often be attained at an inconsiderable depth; their execution, therefore, requires in many cases only a simple boring apparatus, often only a hole of small diameter, about 4 to 5 inches, and but few preparatory works, of course, on the supposition, that we should not be obliged previously to sink deep shafts. Whilst executing the negative artesians wells at Stetten, above Lonthal, which I shall have occasion to speak of in the second division of this paper, I had, it is true, my whole complete boring apparatus with me, but I effected both these works by the application of only a few simple instruments, for no accident happened, and I may assert that frequently, especially in clayey soil, a simple augur, turned by hand, will be sufficient.

On the other hand, it may certainly happen that deeper holes are required to be sunk through different beds, in order to meet with absorbent strata, clefts or subterranean currents, which will answer the intended object. Thus, for example, the negative artesian well at the knacker's yard at Bondy, in France, reaches to a depth of 300 feet, and carries off in twenty-four hours 100 cubic metres of water, of which A. Chevalier gives an account in his valuable memoir in the "Journal des Connaissances Usuelles," for December, 1835*; at the same time, describing some other negative artesian wells established in France between the years 1830 and 1840, he draws our attention to the important circumstance that great caution is necessary in sinking absorbing bored wells, especially if they have to take up injurious, infectious fluids, so as not to do any harm to neighbouring wells. On this point this author says, in an impressive manner, among other things :—

"My plain opinion is, that (*negative*) artesian wells in cities, and generally in large towns, can be made use of with great advantage for health, for owners of houses, as well as for agriculture, as means of drainage, if none of the above-mentioned disadvantages are to be apprehended. With respect to health great advantage might be derived from them, for they would enable us, 1st, to establish in larger institutions, as *e.g.* in barracks, hospitals, infirmaries, &c., water-closets à la Gourlier, as they are called, and to carry off, into a subterraneous water stratum, the urine which separates from the solid substances. 2nd. We might proceed in a similar way in distinct quarters of towns, and likewise establish for any particular groups of houses a drainage for the urine and other infectious fluids.† 3rd. Finally, sewers, which are often so detrimental to health, might in this manner be done away with. The owners of houses would receive this advantage from them, that their expenses for clearing would be diminished, since only solid substances would remain in the sinks, which are easily converted into manure as they lie, or would certainly be bought at good prices by the compost manufacturers. For agriculture, lastly, the considerable advantage would arise, that manure, which hitherto, not unfrequently, is in a great measure lost, could be prepared quickly, and without any detrimental infection of the atmosphere.

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* The observations on the increase of the temperature in the bore at Grenelle, made by Messrs. Arago and Walferdin, are given pp. 246-247, in my appendix to the German edition of "Viollet's Théorie des Puits Artésiens," according to a direct communication which I received from M. Viollet in Paris, July 4th, 1841.

* Or German translation, see "Dingler's Polytechnisches Journal," sechzigster Band, 1836, pp. 58-61. "Ueber die Ableitung übelriechender und für die Gesundheit nachtheiliger Flüssigkeiten in unterirdische Wasserströmungen. Von Herrn A. Chevalier.

† "To this the objection might be made that this measure would be impracticable at the present time; but, on the other hand, we must remind our readers, that, in measures for health in a large town, we should pay regard not only to that which can be performed immediately, but also to that which may be

"I confine myself to these few remarks for the present, for my purpose is only to turn the public attention to a method, which, in my opinion, is likely to become of great advantage, but which cannot be executed till it has been practically shown that none of the above-mentioned detriments can arise from it. If that should be the case, a great advantage would be conferred upon the factories of starch and salt, slaughter-houses, washing establishments, dye-houses, distilleries, and many other factories in which it is often difficult to get rid of the foul waste waters, and against the erection of which the whole neighbourhood usually complains. The permanent sewers also, which, at present, infect whole communities, could easily be got rid of by this method."

Even the waste water of common flowing and artesian wells can often be led off into absorbent strata, if the local conditions are unfavourable to the establishment of channels, drains, or canals. Suppose we have bored a spring rising and delivering itself on the surface of the soil; and, in order to prevent any loss of water hereafter, we have previously been obliged to isolate a negative (absorbent) stratum by means of tubes. In such a case, I say, in order to carry away the superfluous water, nothing better can be done than to bore a second hole in the same shaft in which the artesian well has been constructed, down to the underlying negative stratum, and to lead the water in question into the latter, premising that the absorbing power of the said stratum has previously been ascertained.[*]

I have even gone beyond the expedient just proposed, as the following fact will show:—

Towards the end of the year 1830, after I had successfully established an artesian well in the keuper formation (upper division of the trias deposit) of a large town in Bavaria, I let its superfluous water flow directly down into the boring-shaft itself, in order to avoid an expensive construction of channels. The latter was sunk in the superincumbent diluvium (sand, gravel, pebbles, and boulders), and the water thus led into it runs away entirely, without in the least injuring the neighbouring cellars, &c., because the bottom of the shaft lies deeper than the bottoms of the latter.

A tap should never be put into the tube of an artesian well for drawing off its waters as required, as it is injurious to check their flow.

F. Degousée discusses clearly, in his "Guide du Sondeur,"[†] (Paris, 1847) sink-wells and their advantages, principally speaking of those which are adapted for large manufactories, &c., and quoting the chief police regulations published in France on the 10th June, 1838, relating to the absorption of noxious water.

In the first article, we find—"No common or sink-well is to be bored, no bored hole or the like is to be undertaken, before a previous declaration in writing has been sent to the prefect of police at Paris, and to the mayors in the country districts. This declaration must point out the place where such undertakings are intended to be carried out."

In the fourteenth article we read—"No sink, or sink-well, shall be established without special permission; but this will be given, if it can be done consistently with the declaration prescribed by the first article."

"The depth of the sink-well will be fixed in the license, if granted."

"All the regulations for sink-wells must be applied to such sinks as shall be executed above or near sink-wells."

At the same time Degousée draws attention to the fact that a bored well can absorb as much water as it is capable of supplying, and he points to a successful proceeding which some landlords in France make use of to drain districts which are so marshy that they cannot be used. They perforate with the augur the impervious surface-bed, which is generally of inconsiderable thickness, till they reach the porous or absorbent stratum; this perforation is always made in the furrows from 100 to 200 metres distant, and is quickly done. In order to prevent a stoppage of such absorbent bored holes, they are protected at the top by a basket-work of briers or brushwood, and a fascine is also put into every bored hole.

This simple and cheap method of drainage deserves the preference, in some cases, over the tube drainage, which is expensive, occasionally stopped, and therefore requires repeated repairs;[*] it can be successfully executed in many other countries and formations wherever the natural conditions are favourable, which a clever and experienced engineer and geologist cannot fail to discover.

This kind of drainage, by means of borings, although sometimes it is necessary to carry it out in a somewhat more complicated manner, is of great importance for agriculture in cases where the rain water, for want of fall, cannot flow off, and the upper ground is too clayey to allow the infiltration of it. Under such circumstances, of course, it must remain on the surface of the soil as a stagnant fluid, and produce an injurious effect upon the vegetation, for evaporation, although highly active during some hot months in the year, cannot carry it off entirely.

We must not by any means imagine that for the drainage of marshy countries, wet cellars, &c., it is absolutely necessary after the perforation of the upper impervious beds (potter's clay, clay marl, &c.), to meet with an extensive ramification of fissures, negative strata or subterraneous currents, into which the waters to be carried off flow down and disappear. If beneath the impervious mass are deposited sand, gravel, pebbles, sandy clay or sandy marl, &c., these beds suffice in many cases for a permanent, though occasionally a slow absorption. But if the quantity of water to be sunk should be considerable and continually renewed, then of course,

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done in the time to come. Besides, from time to time entire streets are newly built, and in such cases the proceeding in question might be applied by compelling the proprietors of houses to build in such a manner, that the fluids running off from the sinks might disappear in a well to be established in the middle of the street. The owners of the houses would willingly submit to such an arrangement, since it is proved that the sinks contain a very small quantity of solid substances in comparison to the fluids, and so the respective proprietors would have to pay much less for clearing them."

[*] M. Arago notices, in the "Annuaire pour l'an 1835," pp. 246-247, a remarkable boring at St. Denis, accomplished by M. Mulot, involving at the same time a positive and a negative artesian well—a proceeding which in some cases is practicable.

[†] Or see pp. 105-109 of the German translation of this book. "Die Anwendung des Erd-oder Bergbohrers zur Aufsuchung nützlicher Mineralien, als Bausteine, Kalk, Stein-und-Braunkohlen, Steinsalz u. dgl. m., zum Schürfen oder zur Erforschung der Erzlagerstätten, zum Erbohren von artesischen Brunnen, von Senkbrunnen und von Salzquellen; zur Verschaffung von Wasser—und Wetterlosung in den Grubenbauten und Steinbrüchen, wie auch zur Erforschung des Grundes für ökonomische und bauliche Zwecke, und endlich zum Sprengen von Felsen unter dem Meeresspiegel. Von I. Degousée, Civil Ingenieur. Mit Benutzung der neuesten Belehrungen und Anweisungen von Amedée Burat. Aus dem Französischen. Mit 25 Tafeln Abbildungen. Quedlinburg, Druck und Verlag von Gottfr. Basse. 1851."

[*] At least according to the experience of many in Germany.

powerfully absorbent strata, clefts, or cavities, must be opened up with a hole of larger diameter, even if necessary to descend to a considerable depth.

It may be seen by what I have said up to this point, that the establishment of absorbing bored wells, admits of numerous most important and economical practical applications as well to manufactures and agriculture as the purification of the air in populous towns, &c. It is to be hoped that the time has now arrived when a more general attention will be paid to this useful object.

As it is well-known that by running waters, fountains, &c., the air is purified, so the same salutary effect can be produced by leading off injurious fluids into absorbent holes. Let us go still further. What advantages and beneficial effects might not be expected from the establishment of negative artesian wells[*] in certain distant southern countries on the shores of the sea, where, by a continued formation of mud-beaches, marsh, and decomposing vegetable matters, miasmata continually rise, poison the air, and thus produce typhus and intermittent fevers, rendering the colonisation of those otherwise so highly productive countries extremely difficult. I refer more particularly to Guiana and Java.

Let us hope that the governments who in their colonies have marshy unhealthy districts, will take up this idea; the result will show them that such works would benefit their subjects and increase their own prosperity. The following example on the European continent is calculated to support my assertion:—

Since the works of drainage at Laibach, now nearly finished, have been energetically undertaken, although executed in the common way, not only much fertile land for culture has been acquired, but also the climate of Laibach and all its environs has essentially improved.[†]

England appears, up to this day, not to possess an absorbing bored well, or at least no perforation which has designedly been undertaken for getting rid of superfluous or injurious waters; thus I find in the above-mentioned "Rudimentary Treatise on Well Digging, Boring, and Pump-work" (London, Weale, 1854), pp. 6-7, the following passage:—

"There is, however, an application which is not sufficiently known in England, notwithstanding that an account of it has appeared in some of our professional journals; it is in the formation of absorbing wells, by means of which the waste waters of some branches of industry may be removed by their being carried down to an absorbent substratum, and some curious natural laws have been divulged by the experiments to which such works have given rise."

Then, on page 7, these remarks from Degousée's "Guide du Sondeur:"—

"Thus, it has been proved that a well can absorb a quantity of water equal to what it yields. If, for instance, a boring yield 100 gallons per minute, and the water cease to ascend at three feet above the ground, by merely lengthening the tube three feet in addition above the permanent level of the water, 100 gallons may be continually poured in per minute without flowing over the orifice of the tube. If it be desired to make such a boring absorb, say 500 gallons per minute, a pump able to raise that quantity is inserted in the well, and notice is taken of the depth to which it can lower the water-line. If we suppose it to be 15 feet, for instance, it will be sufficient to place a column of that length above the water-line, and the boring will absorb the quantity of 500 gallons. Should the water-line be below the surface of the ground, the absorption by this description of well may be indefinite.

"Care must be taken to prevent any solid matters in suspension in the waters proposed to be absorbed from being carried into the boring, or they would rapidly choke it up. Precautions also require to be taken to prevent the contamination of neighbouring wells."

In Mr. Dempsey's very interesting "Rudimentary Treatise on the Drainage of Districts and Lands" (London, Weale, 1854), negative artesian wells are a few times mentioned, but without naming any practical work of this kind in England. We find at pp. 41-42 this account:—

"Borings similar to those for artesian wells have been executed for the purpose of getting rid of superfluous water and liquid matters. An embankment near Val de Fleury, for the left bank of the Versailles Railway, was drained in this manner by means of *absorbing wells.* A stratum of clay and sand, soaked with the rains of the previous year, forced the bank from its position and destroyed the works. Borings were made, the first of which reached 20 yards in depth, where it arrived at the upper part of the chalk, full of fissures, and which speedily absorbed the water. The subsequent borings were carried to 35 and 40 yards, in order to reach the chalky fissures which communicate with the Seine, and feed the neighbouring wells. Absorbing wells have also been used in France to dispose of the refuse of the lay-stalls. M. Mulot, who superintended the Grenelle artesian well, executed a boring for this purpose at Bondy.[*] Through a perforation 244 feet in depth, two absorbing strata were obtained, one at a depth from 133 to 155 feet, in chalk mixed with silex, and the other from 210 to 244 feet, in argillaceous sand and green and gray sands, containing lignites and pulverized shells. By the first, 70, and by the latter, 140 cubic yards of refuse liquid were absorbed."

After Mr. Dempsey has described Mr. Elkington's deep draining, which took place in the year 1764, he says in sect. 158 (pp. 132-133) of his book—

"The process of tapping is evidently available only when the spring is fed from a higher level, so that the pressure shall suffice to force the water upward through the augur-hole. Another method is sometimes adopted as a substitute for the augur-hole or vertical bore, namely, digging a well of depth proportioned to the pressure, and filling this well with loose stones, through which the water will rise, and thence pass away along the drain, with the bed of which the well communicates. *Similar augur-holes, or wells, may be adopted to effect the precisely opposite object, viz., to make a downward passage of the drainage-water from the drains which intersect an upper and clay stratum only, into a more porous bed beneath, in the body of which the water will become dispersed.*"

The last part of this paragraph is of importance in our considerations, and is calculated to encourage the establishment of negative artesian wells, the more so that it does not hint at the existence of any absorbing bored well in Great Britain, therefore, what I have said in the former pages receives a further confirmation.[†]

It is not my intention to describe here the technical process of boring and the progress made in the art of late; I have already done this in some other works, and some years ago I wrote further on the latest improvements in that art.[*] The reader will have an opportunity, in the course of this paper, of becoming acquainted with my more important literary works, in which he will, among other things, find that my practice in the difficult sinking *water-tight tubes* through the *diluvium* (sand, gravel, pebbles, boulder-stones, &c.), is essentially different from that of other engineers, as will be seen on referring to pp. 89-90 of the work cited below, "Wegweiser, &c." In this book I have quoted and partly criticised whatever of interest the German and French literature furnishes in reference to borings, and I believe that scarcely any important work on this subject has escaped my notice. The English literature was, except some articles translated in German journals,[†] less accessible to me, nor did I understand the English language some years ago; but I have given an historical view and description of several artesian wells, heretofore established in England, pp. 303-313, in my first quoted work, "Vollständige Anleitung zur Anlage, Fertigung und neueren Nutzanwendung der gebohrten oder sogenannten artesischen Brunnen" according to an account in the French work of M. le Vicomte Hericart de Thury: "Considérations Géologiques et Physiques sur la cause du Jaillissement des Eaux des Puits forés ou Fontaines Artificielles," &c.

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[*] Indeed of positive artesian wells, too;—both can subsist side by side.

[†] See, Reisen im südöstlichen Deutschland von I. G. Kohl, Zweiter Band, Leipzig, Friedrich Fleischer, 1852," p. 357, &c.

[*] Already mentioned by me in the preceding pages.

[†] When writing the above, I had no other means of information than that afforded by English published works, as far as I was acquainted with them; but I have lately learnt, in communications I have had with scientific gentlemen—Messrs. E. Binney, in Manchester, S. C. Homersham, and J. Prestwich, jun., in London—that, in England, not only sinks or sink-holes (common in Germany and France), in the upper chalk, but also a few real negative artesian wells (absorbing bored wells) in other formations, have already been established successfully. It would be of great interest to be acquainted with the results obtained.

In addition, I would call the reader's attention to a new and interesting treatise on "Well-Sinking and Earth-Boring Apparatus," given by Mr. David Chadwick, Assoc. Inst. C.E., of Salford, in the supplement to the *Mining Journal*, No. 1,088, Vol. XXVI., London, June 28th, 1856. This paper contains a brief summary of Mr. Chadwick's original manuscript of the above subject, read by him before the Manchester Literary and Philosophical Society, giving a history of wells and well-sinking, commencing with the earliest scriptural records, and continuing down to the present time. He mentions, among others, the name of my late father, von Bruckmann, in reference to the artesian wells at Heilbronn, in Wirtemberg, and my name in respect to negative artesian wells, being acquainted with my latest work published in Germany. As Mr. Chadwick was kind enough to allow me the perusal of his manuscript when I was at Salford, I can only remark, that in the *Mining Journal* a great portion of his paper has been omitted. Mr. Chadwick's final remarks refer to Mr. Colin Mather's invention in earth boring,[‡] a full description of which, with diagrams, furnished by Mr. Mather, appeared in the *Journal of the Society of Arts*, Vol. III., No. 132, June 1, 1855, under the head, "On Earth-Boring Machinery," to which a valuable discussion is added. A description will also be found in the *Mining Journal* of June 9th, 1855.

Since my arrival in England, where I have now spent a year, I have discovered why all my former researches, in Germany and France, to obtain English works on artesian wells and borings in general, were necessarily fruitless, for I read in the book already quoted (by Messrs. Swindell and Burnell), pp. vi.-vii., the following lines:—

"In our own language, we can hardly cite any other work than Mr. J. Prestwich's 'Treatise on the Water-bearing Strata of London;'[*] but it is a host in itself, and contains proof of a skill, judgment, and careful observation, which justify our regarding it as a model of practically applied science. From the detached papers by Mr. Clutterbuck and Mr. Dickinson, in the reports by Messrs. Stephenson and Homersham, much valuable information may be obtained, as also occasionally from the reports of the superintending inspectors of the Board of Health."

It would far surpass the limits of my present paper on "Absorbing Bored Wells," to say much on positive artesian wells, and to speak of the technical methods of boring. On the latter subject we find a short account in the work of Messrs. Swindell and Burnell, in chap. v. pp. 38-51; and on p. 51 the words:—

"It must not be understood that the above description comprehends every tool used by well-borers. Each contractor, in fact, has his own system, and the nature of the ground to be operated upon varies so much in one locality from what it is in another, that every case requires to be treated, as it were, upon its own merits. In M. Degousée's work[†] will be found ample illustrations of the various tools he has employed in his extensive practice, and the reader who would desire further information upon this subject, is referred to it and to Burat's 'Géologie appliquée à la Recherche des Minéraux utiles.'"

I confine myself to a few remarks on Chapter V., just quoted, because the authors do not mention in any way the German literature on borings, though it is at present more copious and contains more important matter than the French.

At pp. 46-47, it is Herr von Althaus, and not Herr von Oeynhausen, who invented the slide-joint (German: Bohrscheere, Rutschsheere, or Wechselstück), as may be seen from the note on p. 120 of my "Wegweiser durch den Berg-und Brunnenbohrwald." The mistake that Herr von Oeynhausen is the inventor of the slide-joint long prevailed even in Germany.

The most important progress in the art of boring made lately, is the invention of the dropping-borer, or free-falling tool (German: Freifallbohrer, Freifallinstrument, or Abfallstück), not well known to M. Degousée when he published his work, as will be found on pp. 77 and 85 of my "Wegweiser, &c." It was Mr. Rost who invented this interesting boring-tool, which is principally useful for deep borings, and after he had communicated his idea to Mr. Kind, the latter constructed it in the year 1844, and first made use of it at Mondorf, near Luxemburg, to a depth of 713 metres. This perforation is at present the deepest in the whole of Europe, for we know that the artesian well in the slaughter-house at Grenelle, near Paris, reaches only to a depth of 548 metres.[‡] In my "Wegweiser, &c.," I have so often mentioned the dropping-borer (Freifallinstrument), and spoken of it so much, that I cannot do better than to refer to this book, of which a review is to be found in the "Heidelberger Jahrbücher der Literatur, Nr. 10, 1853, p. 145," as I have already remarked.

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[*] See my Wegweiser durch den Berg-und Brunnenbohrwald oder chronologische Zusammenstellung der über Bergbohrkunde Anlegung artesischer und gewöhnlicher Brunnen, wie auch Quellenbildung, erschienenen älteren und neueren Literatur in selbstständigen Werken und zerstreuten Aufsätzen, nebst manchen kritischen Bemerkungen und Erläuterungen über dieselben. Ein Handbuch für Alle, die sich mit Berg-und-Brunnenbohrungen, auch Brunnenanlagen überhaupt beschäftigen oder dafür aus ökonomischen Gründen interessiren. Darmstadt, 1852. Verlag der Hofbuchhandlung von G. Jonghaus." A review of this book is to be found in the "Heidelberger Jahrbücher der Literatur," Nr. 10, 1853. p. 145.

[†] See for example : y ^{3} p. 121, and n^{5} pp. 142-143, concerning the accounts of Messrs. Robert Beart, at Godmanchester, and William Gosswych Gard, at Calstock, in my "Wegweiser durch den Berg-und Brunnenbohrwald."

[‡] I may be allowed to remark that boring heads, similar to that of Mr. Colin Mather's, about twenty years ago were tried in Germany in combination with the Chinese system, but have been since abandoned, *e.g.*, by Messrs. von Alberti, von Althaus, Froman, Kinderman, von Sello, and others. Those who wish to inform themselves on this subject, may be pleased to read the works and detached papers quoted in my "Wegweiser durch den Berg-und Brunnenbohrwald."

[*] A geological inquiry respecting the water-bearing strata of the country around London, with reference especially to the water-supply of the metropolis; and including some remarks on springs. By Joseph Prestwich, jun., F.G.S. London: John van Voorst, Paternoster-row, 1851. Indeed an excellent work.

[†] I have given a review of Degousée's work, pp. 76-91, in my "Wegweiser durch den Berg-und Brunnenbohrwald." This may be of interest to those who possess Degousée's book.

[‡] See the Manchester *Examiner* and *Times*, March 22, 1856. M. Dumas has lately communicated to the Academy of Sciences an account of the progress of the gigantic artesian well which M. Kind is sinking at the Bois de Boulogne, for the purpose of supplying the lake with water. The depth attained is 500 metres. On the 1st of May next it is expected that the depth of 700 metres will be reached. This is 152 metres deeper than the famous artesian well at Grenelle. When this depth is attained, it is calculated that the flow of water will equal that of the Seine under the bridge of La Tournelle, at Paris.

I now conclude the first division of my paper, my chief intention being to show the advantages of negative artesian wells for the various purposes of drainage, as well as to demonstrate in general the importance of extending the use of such absorbing borings in England, at the same time describing some recent actual operations of my own in Germany.

IRISH FISHERIES.

The Annual Report of the Commissioners for administering the Fishery Laws of Ireland, has just been issued, with an appendix containing the Report of the Inspecting Commissioners of Fisheries for 1855, a statement from the Royal Irish Fisheries Company, and a mass of correspondence and tables relating to this important subject.

It appears that the deep-sea fisheries are not in the prosperous condition which could be desired. As regards the inland or salmon fisheries, the Commissioners announce that they are progressing and rapidly improving, and that the Local Boards of Conservators are exerting themselves with zeal and success in carrying out the laws, which are generally approved. The Inspecting Commissioners in their report say that, notwithstanding they have had great difficulty in getting accurate returns, it is beyond question that the number of vessels and of men employed in the sea fisheries still continues annually to diminish. In the large fishery ports the demand for the navy and for the mercantile marine has operated to such an extent as to leave few but old and feeble men and young boys behind. Amongst the coast population who used occasionally to resort to the fisheries, the unusual rate of wages and the demand for labourers in the more certain pursuit of agriculture, has absorbed much the largest proportion; and the want of habitations upon the coast has prevented many persons from resuming their former occupations. This state of things has, in addition to an unusually unfavourable season, produced very high prices, the natural result of diminished supplies; and the metropolis, as well as the principal inland towns, have had reason to complain of great scarcity of fish since last autumn. This dearth of supply has been particularly marked on the whole line of coast from the river Kenmare, round southward and eastward, to Dublin, including the districts of Bantry, Skibbereen, Kinsale, Cork, Youghal, Dungarvan, Waterford, Wexford, and Wicklow. In the Dublin district it is said to have been better than last year, but from the coast of Louth round to the lough of Belfast the deficiency was considerable.

The extreme north and north-west of Ireland, including the shores of Antrim, Donegal, Sligo, and part of Mayo, were fairly supplied; while the shores and inlets between Erris Head and Slyne Head seemed to have been wholly deserted, and a better supply is reported to have been taken from Galway bay to the Durzey islands.

In the district of Galway, they report that the condition of the fishermen is improved; their boats and gear, generally speaking, are in good order; the take of fish is more regular and steady; considering the several methods of capture, the quantity of all kinds is larger than for years past, with the exception of herrings, and continues so. No conflicts of any kind have taken place, and the general habits of the fishermen are orderly and peaceable.

At Kinsale there was a greater want of men than of boats, most of the efficient hands having gone away, leaving only the old men and boys behind. The total dearth of herrings and other shoal fish was unparalleled, owing to which the want of bait was felt by the deep-sea fishers to a most deplorable extent. 5s. a gallon has been paid for sprats, and 3d. a-piece for herrings, for bait; and supplies for that purpose were brought from Bantry, from Dublin, and from the Bristol channel. The months of October, November, and December were unusually unfavourable; and ever since there have been nothing but northerly and north-east winds. The report from Kinsale winds up with the statement, that as many herrings have been taken in one night at other times as were taken for the whole of this year.

Attempts have been made to uphold the once flourishing fishery of Kinsale, but many difficulties have arisen, and no greater one than the practice which prevails among the fishermen's wives of depositing with the pawnbrokers the materials supplied to them for the manufacture of nets.

The want of bait in Kinsale is nothing new, and the establishment of great reservoirs of bait in the vicinity of our most important fisheries has been frequently suggested, but the Commissioners say that, notwithstanding the existence of the provisions of the 5th and 6th Vict., c. 106, passed especially for the encouragement of bait beds, they have not, in any single instance, being taken advantage of. They have frequently remonstrated with the people of Kinsale on this matter, but ineffectually. The question of an ample supply of bait for the deep-sea and long-line fishery is one of the most vital importance.

In speaking of the oyster fisheries, the Commissioners refer to the assurances they receive of progressive improvements generally in new beds that have been formed under the protection of licenses issued under the Act of Parliament, but they find that all the public beds within the estuaries and close to the shore are in rapid progress of exhaustion, from having been overworked, and in many cases from a total disregard to provident regulations. Oysters, so small as to be wholly unfit for use, are dredged, and instead of being returned to the beds, they are brought on shore; and when the oysters fit for use are culled, the small ones are thrown away and allowed to perish.

They have recently had ample opportunity of ascertaining that some of those sources of supply which were believed to have been inexhaustible, are diminishing so fast as to render it probable that they will soon cease to exist. Applications having been made to the Board for permission to dredge oysters during the month of May, for brood and planting, from the deep-sea banks in the Bay of Blacksod, in Achill Sound, and Clew Bay; meetings have been held at Westport, at Achill, and at Belmullet, and the result of the inquiry fully confirms the opinion that the banks are already overwrought. Unfortunately there appears to be a reckless disregard of provident habits in the many, and an unwillingness to interfere with the sources of employment in others. The subject demands immediate attention, and requires the application of some remedy.

The Commissioners refer to abstracts of the Reports in the Appendix from the Inspectors of Districts under the several Boards of Conservators, which exhibit a progressive improvement in the Salmon fisheries—the result of an organised system for the care and protection of the parent fish and fry, which is the main point to be relied upon in developing the resources of the inland or fresh waters of Ireland, which are so eminently calculated, by their extent and natural character, to yield an abundant harvest, if a provident principle be observed in sparing a sufficient stock for brood, and duly protecting that stock, when and where their seed is being distributed, which alone can ensure an ample return in reproduction.

The Commissioners urge this "oft-told truism" for the purpose of bringing under consideration some material points bearing upon the question of providing for a sufficient "sowing of the seed" throughout the rivers of the country. The most important and first in order is the question of close season.

Upon this point the Board are pressed by many parties to sanction changes suitable (as it is alleged) to the circumstances of different rivers—and, no doubt, the times at which salmon in good condition begin to ascend the rivers in Ireland, are variable; and they have recommended many modifications of the uniform principle provided by the Act 5 and 6 Vic., c. 106, and confirmed by the 9th and 10th Vic., c. 114; but they find great difficulty in satisfying the many conflicting parties concerned, whose opinions are often too much governed by local circumstances to permit them to take an enlarged view of the question at issue, with reference even to their own real interest. Thus, lower tidal fishers will advocate an early commencement, because they may take a few good fish in prime condition, and no doubt procure a high price; but overlooking the fact, that, at a short distance above them, at the same period, in narrower channels, hundreds of spent fish would be captured in a state of little, if any, worth, which, if allowed to escape, would descend to the sea, and in a few weeks return again in prime order, and of proportionately increased value, of which the lower captors would obtain the first fruits, far the largest share. To meet this difficulty, the Act 9 and 10 Vic., c. 114, provided an early commencement for the tideways, and a later for the fresh waters, one month being the period of difference; but the Board find that this arrangement has not been successful in allaying discontent, the upper fishers complaining that an undue restriction was placed on them, solely for the benefit of one class, who, they maintain, should forego a portion of the early fishing, if it be an object to prevent the capture of spent fish above, which, if spared, would descend, and first fall into the lower nets in a state of increased value. In four important districts—Cork, Waterford, Killarney, and Limerick—the Board have sanctioned the rescinding of this principle of distinction between tidal and fresh waters in the commencement of the open season, with the almost unanimous concurrence of the several parties interested; but it is with regret that the Board find that vast quantities of spent fish have been captured during the early portions of the two last seasons, and that too many persons who fish in the upper or fresh waters, and some in the tideways, have, as reported, systematically sought to take and kill them, when it might be avoided, and means easily adopted to enlarge those fish without injury. If a few, or even a considerable number of spent fish were sacrificed, it might not be much matter, because they have performed the important office of sowing the seed; but wholesale destruction, such as reported to us from some localities, must, if continued, materially diminish the value of the fisheries. But, recurring to the question of providing for a sufficiency of "seed to sow the ground," a main point must be to retain a number of fish adequate to the object, and this can only be effected by "*closing early.*" The Board have been pressed from many quarters to extend the time of fishing at the end of the season, and they have yielded in some instances to a certain extent, more for the purpose of allowing an experiment to be made by the persons interested, where unanimity prevailed on their parts, than from any confidence on the part of the Board that it was expedient; because the Board have found in many cases a disposition to reject all theory, no matter how well supported by analogous facts, and that nothing short of practical experience can convince the generality of local salmon fishers that a general rule is applicable to the river in which they fish. Under such circumstances, the Board appear to have been induced to sanction some changes in a direction not in accordance with their own views, as a power exists to rescind such regulations, if they should be found not suitable, after a lapse of three years. An argument is often pressed to justify an extension of the fishing season, which in many instances the Board do not admit to be well founded; namely—that because the fish may be in good marketable condition at a certain season in certain localities in the latter part of the year, that, therefore, they should be taken, and that it is a waste not to do so. It so happens, however, that the fish in many tideways "hang" in them, as the term is, and do not seek to ascend the rivers until late in October, or November; and under such circumstances, if the season be extended, nearly the whole of those fish may be taken, and the rivers left barren for want of spawn; so that the question is not, whether the fish be in good or bad condition, but whether a sufficient stock will be left for brood in the upper waters, and it should be remembered that the means of capture in the sea and tideways have been greatly increased within latter years, and improved skill has been called into action by the enhanced value of the article sought for, and that hence, unless the time of capture be duly limited, the waters generally may be "fished out," as in some instances they have been, where uncontrolled capture has been injudiciously permitted, and practised.

The next point bearing upon the stocking of the upper waters for brood, is providing passes over obstructions. This object has been well effected in many instances, and applications continue to be made for such constructions; but the progress of affording means for the upward passage of fish is much too slow, when it is considered how materially the full development of the salmon fisheries is retarded thereby. In many places barriers now exist, where fish cannot pass; in others, the heavy autumn fish are detained too long by the difficulty of ascending in their then unwieldy state, and great deficiency in supplying the spawning grounds is the consequence. It has been suggested by many, that, to effect without delay a general provision of passes throughout the important rivers, it would be desirable to provide for the obtaining of advances of money for this object, to be repaid by instalments out of the funds derivable from licence duties; but the difficulty is to propose a source from which such loans might be obtained. Two objects should be held in view by those interested with respect to migratory passes; first, the all-important one of allowing the brood fish to ascend in autumn and winter to the spawning fords; secondly, to allow a fair proportion of fish during the spring and summer months to reach to the upper proprietors, who are equitably entitled to their share, and it is the interest of all below to yield it, for the purpose of securing their co-operation in protection during close seasons, and thus stimulating their zeal by securing them some participation in the advantages to be derived.

The Commissioners report that the experiments commenced in reference to the artificial propagation of salmon continue to be followed up by several, who laudably persevere in endeavouring to render it applicable, on a large scale, for general advantage, and the progress of their operations is watched with much interest. Much must depend upon the proper management of the young fish up to the time of their enlargement from the artificial ponds, and the Commissioners are of opinion that they should not be detained very long. Many communications have been received from Perth, reporting the progress there, all of which seem to promise success. Indeed, so far as capturing some of the marked fish, which had attained a large size after their first visit to the sea, it may be said that success has been realized, but it yet remains to be proved to what extent the commercial value of the salmon fisheries may be increased by such means, beyond that which arises from the ordinary operations of nature.

The success of the models of fish ladders, exhibited in Dublin in 1853, in attracting attention and promoting their adoption, has been followed by an interest created in Paris, at the Exhibition of 1855, even exceeding the former. Crowds daily attended to witness the exhibition of their use by the little fish ascending. All classes, and the people of all nations, were attracted by them. The Emperor and Empress of the French, as well as the crowned heads of other countries, expressed their approbation of this valuable contrivance; and the International Jury awarded two medals in consideration of their merits, as applying to so important an object as the cultivation of the inland or fresh waters of all countries, possessing such sources of commercial value, if duly appreciated and managed with judicious care. Persons from Canada obtained plans and drawings of the models, with the view of adopting them in that country, where it it is found that the increased erections of weirs, for the purpose of obtaining water-power to work sawing mills, has considerably interfered with the salmon fisheries, in some localities, by obstructing the ascent of the fish.

The following extracts, from the Report of Mr. Brady, who had charge of the models in Paris, will more fully explain the success of the exhibition there; and the Board feel bound to state, that Mr. Brady deserves much credit for the manner in which he arranged and conducted all the matters entrusted to his care, and that they are indebted to him for much valuable and interesting information relating to inland fisheries which he collected while in France:—

Extracts from Mr. Brady's Report.

"Amongst the models sent to Paris by the Board were—

"A working model of a design for a fish passage over a mill weir, without injuring the water power of the mill, by William Forsyth, C.E.; and a working model of the regulating weir, with fish passage, erected by the Commissioners of Public Works, on the river Corrib, at Galway.

"These were the most attractive models of all that had been sent over. All were arranged in their proper places, and the department in fair order by the 15th of May, the day on which the opening of the Exhibition took place.

"Immediately after that ceremony tradesmen were employed to connect the models with leaden pipes, and adjust them fairly, to prepare for the water passing through them, and for the reception of the young fish.

"As soon as this had been completed, the department was assailed by numbers of persons who recognised the models, as having seen them in the Dublin Exhibition, and were daily inquiring when the young fish would be placed in them, to illustrate the working of the fish ladders.

"It was, however, some time before the necessary supply of water could be procured, and when this was accomplished, the next object was to try and get some young trout, or other migratory fish, which would, by instinct, ascend the ladders against the current of water running down the fish passage. Here, again, was experienced great difficulty, as the laws against any mode of fishing in the fresh waters in that department of the empire, before the 15th June, are very stringent; and, indeed, even after that date, it would have been both difficult and expensive to get such fish as were required, there being very few trout in the river Seine, and no salmon, had it not been for the kindness of M. C. Millet, Inspecteur des Eaux et Forets, who took a very lively interest in the good working of our models, and procured a quantity of artificially bred minnow, trout, salmon, and gudgeon. M. Millet has devoted a great deal of time to the artificial propagation of fish of every species, both sea and river. He has some excellent apparatus for breeding fish, and furnished a vast deal of information on this subject, and the fisheries of France in general. The Board are really greatly indebted to this gentleman for his exertions.

"The fish were not in the models many days before the department was honoured with a visit from the Emperor and Empress and suite, who remained for such a length of time that it caused no little jealousy amongst other exhibitors. The Emperor asked a great number of questions, and entered fully into conversation on the subject of the Irish Fisheries.

"On leaving the department the Emperor said he was much pleased with all he had seen and heard, and was obliged, and the Empress said they 'should pay another visit.'

"From this time forward the department was, if possible, more crowded by visitors than ever, all eager to get a peep at that exhibition which detained their Majesties so long, and there was but one feeling of pleasure at what they had seen in the models. It would be tedious to attempt to repeat the various expressions of gratification which were made use of by almost every one who visited the department; sufficient to say, the excitement and the crowds of people became so great, that it was necessary to get up a strong rail round the models to protect them from the pressure of the crowd.

"The fish ladder or passage was there quite unknown, or at least, if known, had not been adopted in France, and, therefore, was a subject of great curiosity and interest with scientific men, and it is likely that it will be immediately adopted on the weirs in the rivers in France. The Canadian Commissioners were much attracted by them, and took plans of the fish passes, &c., with a view of having them brought into operation in that country, where it appears they may be much required to enable the fish to overcome weirs which have been erected for the purpose of obtaining water-power to work saw-mills in that land of forests.

"The original inventor, or, rather discoverer of the means by which salmon might be enabled to overcome difficulties either natural or artificial, in their proper element, was at the Exhibition.

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"I visited the College de France, in Paris, where artificial propagation of fish is carried on to a large extent, and has been for a considerable time. I met Monsieur Coste, and saw in his breeding apparatus about 400,000 young salmon and trout, about two months old. I also saw there, in ponds, several salmon weighing from two to three pounds each, and upwards; these fish had never been afforded the opportunity of descending to the sea, but were confined in ponds, and regularly fed; though they had attained this weight, they were lank, ill-shaped fish, exhibiting the deficiency in condition, in consequence of their continued confinement in the fresh water, and restraint from their natural migration to the sea.

"I also witnessed the mode of fishing on the Seine, and saw a large capture of eels. The fish, particularly the eels, were remarkably good and large; but the modes of capture inferior to ours.

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"In conclusion, I beg to say, the models, and the young fish, created a greater interest than any other department in that Exhibition where the products of the world were introduced, and which was acknowledged by the resolution of the British Jurors of the 2nd of July, to have excelled that of 1851; and a greater evidence of this truth cannot be adduced than the distinguished honours that have been awarded to the Commissioners —first, by the International Jury awarding two medals, and next by the election of the Chairman and Secretary to the high position of honorary members of the Imperial Société Zoologique d'Acclimitation.

"THOMAS F. BRADY."

The principle of fish passages over weirs in rivers was first introduced by the late William Smith, Esq., of Deanston. The following is an extract from a letter received from his cousin, Mr. James Buchanan, of Glasgow, on the subject:—

Extracts from Mr. Buchanan's Letter.

"As it may interest you to know something of the origin of the first salmon stairs, I give you the following particulars, which will show that the salmon was itself the originator of the idea. The winter of 1827 saw the Deanston dam completed; Mr. Smith left about ten feet next the flood-gates lower by about thirteen inches, expecting that as the water would always be deepest there, if any were coming over the dam at all, the fish would easily find their way up, more especially at night, and when the works were stopped. He had gone to Manchester just as it was finished, before any fresh had occurred to flood the river, and cause the fish to run up to the spawning grounds above. In the unfinished state of the dam the fish had congregated in great numbers below it, till, a part giving way, a gap was made by which they were enabled to get up through the broken water into the dam itself. After Mr. Smith had been gone a few days only, there occurred a flood in the Leith, and you may judge of my chagrin and annoyance to find that no fish could stem the current in the intended salmon race more than about one-third only of the whole length, so that all were swept back by the current as they made the attempt. Hundreds were in the deep water at the tail of the dam, apparently worn out by their fruitless efforts to ascend, or perhaps were naturally more tame at that season, for they allowed my approach to the bank without moving away. I had placed two large flat stones in the current, a few feet upwards from the deep water, to enable me to stand and examine the fish as they lay; all at once a fine large one sprang up into the broken or dead water caused by my stepping stones, and lay there, apparently at its ease. The thought then struck me to lay another retarder to the over-

powering stream, a few feet higher up. In a few minutes the same fish, without my losing sight of him, sprang up to this second place of rest. As plenty of large iron spikes, used in the construction of the wood-works of the dam, were at hand, I drove two, at about three feet separate, into the seams of the stone about the same distance up on the opposite side of the run, and laid a bit of board, a few feet long and about twelve inches broad, against them; the rush of water downwards held it against the nails. In a short time the fish was up and in the broken water. I now placed nails in a similar way, and a board, in the opposite side, to which he sprang. With two bits of board changed from one set of nails to the other, he worked up till about within a third of the ascent, when, apparently as if knowing its own powers, it made a spring out of the run and ran up the slope of the dam into the deep water within. I lost no time in getting boards placed at each set of nails, so that before it was too dark to see how matters went on, I had the satisfaction to perceive many a fine fish over in safety. By next morning none were to be seen, and but at a very chance time afterwards below the dam.

"As this frail ladder was frequently swept away, on Mr. Smith's return, a few weeks afterwards, he had short pieces of log, about six by twelve inches deep and six feet long, bolted firmly to the stone. It was curious to remark how far each fish, according to his strength, made use of the ladder before he ventured to spring over into the dam itself. I have certainly seen a few fine fish go up the ladder to the top and glide slowly into the dam without ever attempting to leave the run itself. It was rare that any fish left the ladder before he got so high up as to be able to reach the breast of the dam in safety. I have seen a few miscalculate their strength, and roll down either into the lower part of the ladder run or quite into deep water at the foot; but this was always the exception.

"JAMES BUCHANAN."

The statement received from the Royal Irish Fisheries Company shows that, though a tolerable profit has been made by the trawlers, the season has been a very indifferent one, owing principally to continued calms and light easterly winds. In the corresponding months of previous years more fish was taken with only two vessels. The Company say, "A heavy gale from the south-west, now that the turbot and dorey are coming in, would more than double our profits." January being generally the month in the worst year, the two largest vessels, then recently purchased, were not fitted out until the end of the month; a profit, however, having been made by the others, the accounts do not show all that might have been realised had the whole fleet been fishing from the commencement of the year.

The masters of the six first-class vessels get £1 6s. per week, besides a gratuity of 5 per cent. on the profits. They are all thorough seamen and skilled fishermen. They are all obliged to keep a log, detailing the particulars of each day's work, wind and weather, the fish taken each day, and any remarkable occurrence; and must send a copy of it, with their account, to Dublin weekly, through the hands of the agent of the station, who certifies that the fish has been duly received and forwarded, and that their sailings and arrivals have been correctly stated. So regular are they in making these reports, that for years past they have not been known to fail; and during the last four months in only two instances have the Company found them even one day late. The mate—it is optional with the master to have one or not—receives £1 per week wages; and the men before the mast—natives, with scarcely an exception, of the west coast—get from 10s. to 12s. weekly; all may use as much fish of any kind as they please, on board; they are supplied with fuel and candles—in other respects they find themselves. During the very hot weather in the middle of summer, the price of fresh fish will most likely fall. The vessels can, however, then be profitably employed in the deep-sea line fishing, or in buying herrings in any port where they may be largely taken.

Galway is maintained more as a central station, and for the sake of the trawlers, than from any profit the Company derive from curing fish there. It is situated too far in the bay for curing ling; and since the railroad was opened herrings bring too high a price for barrelling, unless a very large quantity be taken, for which they are fully provided. There is a large and daily increasing demand for prime fresh fish there, and arrangements are making to supply Ballinasloe, at the request of some of the principal inhabitants. If this arrangement be found satisfactory, other towns, both on the Midland and South-Western Railway, will be supplied.

The statement shows a profit to the Company of £437 for the four months ended April 26, 1856.

The quantity of fish conveyed by the Great Southern and Western Railway for the year ending 31st December, 1855, was three hundred and eleven tons.

The rates of carriage of fish on the Great Southern and Western Railway were—

Salt Fish	1·909d.	per ton per mile.
Fresh Fish	4·755d.	„

The quantity of fish conveyed by the Midland Great Western Railway for the year ending 31st December, 1855, was—

	Tons.	Cwts.	Qrs.
Salmon, turbot, &c................	82	13	0
Lobsters..........................	94	11	3
Cod, hake, plaice, &c.............	299	0	1
Oysters...........................	166	5	1
Gross...............	642	10	1

The rates of carriage of fish by Midland Great Western Railway were—

Salmon, turbot, &c.............	46s.	per ton
Lobster	46s.	„
Cod, hake, plaice, &c.	30s.	„
Oysters	29s.	„

THE PATENT LAW.

In the House of Lords, on Friday, the 25th of July, Lord Lyndhurst wished to ask his noble friend upon the woolsack if it was his intention to introduce any measure during the next session to amend the law relating to patents.

The Lord Chancellor said that the subject was so beset with difficulties that he could not make any pledge, but it would receive his most careful consideration.

DECAY AND PRESERVATION OF STONEWORK.

In the House of Lords, on Friday, the 25th of July, Lord Lyndhurst presented a petition from John Benjamin Daines, setting forth that he had invented and patented an improved and effectual mode of preserving stone, plaster, cement, and other buildings from decay, indurating and protecting them from atmospheric influences, and neutralising the tendency to alkaline efflorescence,[*] the efficiency of which, the authorities had declared, would be decided upon in two years. That the invention had been submitted to competition with other processes, claiming to have similar virtues, upon the New Palace at Westminster, and was the only one that had succeeded. The petition went on to pray, the petitioner having been informed that certain decaying and deleterious influences had already been at work on portions of the New Palace at Westminster, that the House would inquire into the truth of these allegations; and, if satisfied with the results of such inquiry, that it would accept the use of such patented invention for national purposes. He had himself seen a report from Sir C. Barry, which stated that the result of the invention, which had been tested upon 1,400 square yards of the house, had been entirely satisfactory. Under these circumstances, he begged to ask her Majesty's Government if they were prepared to appoint a committee to inquire into the matter.

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[*] A description of this invention appeared in the *Journal*, No. 191, p. 604.

The Earl of Harrington thought it was too late in the session to appoint a committee.

Lord Lyndhurst said that portions of the stone-work were already beginning to decay, and no time ought to be lost in taking some step to prevent the continuance of that decay.

Home Correspondence.

MR. HAWES' THEORY OF SAPONIFICATION.

SIR,—I send you a specimen of retro-glycerine, made from stearine by direct decomposition, and converted into an oil by a process I have devised. M. Bertholet is the discoverer of a retro-glycerine oil, which he announced to the Academy of Science, at Paris, some years since. I do not know his process, but I have every reason to believe that it can differ very little from that I employ, for the two oils support a great degree of refrigeration; they evince the same properties under the action of light, in regard to polarisation, refraction, &c. This oil produces a most perfect soap, and produces a very white light when in combustion.

I shall send a larger sample in a short time, and shall examine and give its elements, and also ascertain if the glycerine produced from the decomposition of oleine produces the same oil as that produced from stearine.

I am, &c.,
P. C. JENNINGS.

16th July, 1856.

INDURATING MARBLE OR STONE.

SIR,—Mr. Page's process will undoubtedly meet with success. Canova, the great sculptor, always recommended what he called the encaustic process, when his works were to be exposed in the open air; that is to say, melt pure wax in a clean ladle, and with a soft brush cover the marble with two or more coats. When perfectly congealed, hold a red-hot iron plate just so near as to cause the whole of the wax to sink into the marble. Stone or marble thus treated will never lose its colour, and, if white, will remain so. If the stone or marble should become soiled with dirt and smoke, it may be easily washed without the slightest injury. This encaustic process is applicable to both stucco and plaster casts, which latter may then be freely exposed to the weather with perfect safety. It is strongly recommended by Vitruvius, Pliny, and other old writers on such subjects, and is one of the secrets of the long preservation of the painted decorations of the cities of Pompeii and Herculaneum.

Previous washings with clear alkaline solutions will of course destroy all traces of grease, which is highly injurious.

I am, &c.,
HENRY W. REVELEY.

Proceedings of Institutions.

WHITEHAVEN.—The half-yearly general meeting of the members of the Mechanics' Institution, for the election of officers and the transaction of general business, was held in the Lecture-room, Queen-street, on the 21st of July. The attendance was not so large as might have been anticipated, and the chair was taken *pro forma* by the president, Mr. Smith, who opened the proceedings by a short exposition of the mode of conducting the election. The Secretary then proceeded to read the report, which was unanimously adopted. The report commenced by expressing the pleasure experienced by the Committee at the prosperous state of the Institution, the number of members at present being 306, which shows an increase of 30 on the half-year. A classification of the members shows the following results:—17 honorary, 190 ordinary, 88 apprentices, and 11 ladies. To the library the Committee have devoted considerable attention, and that important adjunct to an educational institution has been greatly extended and improved. Forty-eight new volumes have been purchased through the Society of Arts, and among the additions are some very important works. In the early part of the half-year classes were in operation for instruction in drawing and geometry, and the French and German languages; but with the exception of that for drawing, their operations have been suspended during the summer months. A discussion class, which was in existence during winter, had also suspended its meetings. The report also stated that Mr. William Cape had announced his intention to offer his services gratuitously to conduct a class for instruction in English grammar. From the statement of accounts it appeared that the receipts of the half-year, notwithstanding a considerable extraordinary outlay on the library, exceeded the disbursements by £5 14s. 6d., which amount is carried to the credit of the ensuing half-year. The receipts altogether amounted to £54 15s. 7d., and included £42 15s. as subscriptions of members, and £9 15s. 9½d. as the profits on the annual *soirée*, in January. The election of officers was then proceeded with, Mr. J. C. Brown being elected president in place of Mr. Smith, and the following gentlemen elected members of the Committee of Management in place of a like number who retired by seniority:—Messrs. Wm. Smith, William Elliott, John Jackson, Thomas Hannah, C. H. Davis, and the Rev. W. Lyde. Mr. S. Armstrong was re-elected Secretary, and a vote of thanks was unanimously awarded to him for his past services. Librarians were also appointed, and the proceedings terminated with announcing the result of the election of the president and members of the Committee, as given above.

To Correspondents.

ERRATUM.—Last number, p. 610, col. 2, line 11 from top, for "Kopaës" read "Kopäis;" in same column, in note, line 2, for "der" read "den;" same column, same note, last line but one, for "1855" read "1835;" p. 611, line 7, col. 1, insert "near" between "on" and "or;" p. 612, col. 1, line 23, for "Amter-hausen" read "Amtenbausen;" same page, col. 2, line 35 from the bottom, insert "to" between "waters" and "sink;" in line 9 from the bottom, for "1820" read "1840;" and last line but six, after "beds" *dele* (").

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. No.

Delivered on 19th and 21st July, 1856.

320. Poor Law (Ireland)—Returns.
347. Civil Contingencies—Account.
367. Burial Acts—Lords' Report.
368. Public Offices—Report from Committee.
333. Metropolis Turnpike Roads—Report from Committee.
363. Standing Orders Revision—Report from Committee.
254. Bills—Dulwich College.

255. Bills—Stoke Poges Hospital.
256. Bills—County Courts Acts Amendment (as Amended in Committee, and on consideration of Bill, as Amended).
257. Bills—Parochial Schools (Scotland) (Lords' Amendments).
258. Bills—Commissioners of Supply (Scotland) (Lords' Amendments).
259. Bills—Dwellings for the Labouring Classes (No. 2) (Ireland).

Delivered on 22nd July, 1856.

331. Medical Department (Army)—Report from Committee.
338. Education (Manchester)—Copy of Correspondence.
360. King's Inns (Dublin)—Return.
361. Unity Joint-Stock Mutual Banking Association—Copy of Case and Opinions.
369. Ecclesiastical Commission, &c.—3rd Report from Committee.
374. New Palace at Westminster—Copy of Further Treasury Minute.
260. Bill—Proctors in Ecclesiastical Courts.
Criminal Offenders (Scotland)—Tables.

Delivered on 23rd July, 1856.

348. Public Income and Expenditure (Balance Sheet)—Account.
377. Bishops of London and Durham—Copies of Correspondence.
261. Bills—Hay and Straw Trade (Amended).
262. Bills—Metropolis Local Management Act Amendment (Lords' Amendments).
263. Bills—Oxford College Estates (Lords' Amendments).
264. Bills—Bishop of London and Durham Retirement.

Delivered on 24th July, 1856.

327. Juvenile Offenders (Ireland)—Return.
351. Imports and Exports (Australia, &c.)—Return.
265. Bills—Formation, &c., of Parishes (Lords' Amendments).
266. Bills—Sheep, &c., Contagious Diseases Prevention.
Army—Report of the Board of General Officers.

Delivered on 25th July, 1856.

365. Coinage—Account.
370. National Vaccine Board—Annual Report.
371. Stipendiary Magistrates—Return.
373. Brewers, &c.—Return.
389. New Westminster Bridge—Report from Committee.
391. Belize—Copy of a Letter.
356. Oxford University—Copies of Orders in Council.
French Military War Medal—Names of Non-Commissioned Officers and Soldiers selected for recommendation to the Emperor of the French.

Delivered on 26th July, 1856.

39(6). Trade and Navigation Accounts (30th June, 1856).
385. Racehorses—Return.
380. Sound Dues—Report from Committee.
368. Public Offices—Report and Minutes of Evidence.

Delivered on 28th and 29th July, 1856.

372. County Courts—Return.
386. Petitions for Private Bills—Return.
401. Hampton Court and Kew Gardens—Return.
366. Capital Punishments—Lords' Report.
Prisons—19th Report of the Inspectors (Home District) Part 1.
Public General Acts—Caps. 55, 56, 57, 58, 59, 60, and 61.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette July 25th*, 1856.]

Dated 20th June, 1856.

1454. Alexander Sands, Manchester—Improvements in apparatus for signalling and for saving life and property at sea, part of which is applicable to signalling on land.

Dated 24th June, 1856.

1482. Joseph Harrison, Blackburn, and Christopher Gelderd, Low-moor, Clitheroe—Improvements in looms for weaving.

Dated 26th June, 1856.

1504. David White, 3, Winchester-place, Clerkenwell—Improved apparatus for the more perfect combustion of gases, for preventing their escape, and the unnecessary radiation of heat therefrom.

Dated 8th July, 1856.

1600. Rev. George Bradshaw Watkins, Godmanchester—Improved apparatus for obtaining infusions or extracts from various substances.
1601. William Youtman, Southampton—Improvements in valves and plugs.
1602. Joseph Henry George Wells, 45, Essex-street, Strand—Improvements in pistons for steam and other motive power engines and pumps in general, and which improvements are also applicable to stuffing boxes. (A communication.)
1603. Joseph Henry George Wells, 45, Essex-street, Strand—Improvements in governors or regulators. (A communication.)
1604. Frederick William Hoffman, New York, U.S.—An improvement or improvements in breech loading fire-arms.
1605. Henry Page, Whitechapel-road, Middlesex—Improvements in ornamenting or decorating glass.
1606. Julien François Belleville, Paris—Certain improvements in generating and applying steam.
1607. Robert Martineau and Brooke Smith, Birmingham—Improvements in taps for drawing off liquids.
1608. Alfred Vincent Newton, 66, Chancery-lane—Improvements in repeating fire-arms. (A communication.)
1609. Alfred Vincent Newton, 66, Chancery-lane—An improved fountain pen.—(A communication.)
1610. Abraham Herts, 22, Bunhill-row, Finsbury—An improved sheet metal bending and tubing machine. (A communication.)
1611. Alexander Gray, Glasgow, N.B., and John Rawson, Bury, Lancashire—Improvements in means or apparatus for lubricating.
1612. Louis Bayer, Soho, London—An improved stuffing to be used in place of hair or other substances in which such articles are commonly employed.
1613. Sewall Short, New London, U.S.—Certain improvements in horse shoes and shoes for other animals.
1614. Henry Pigott, Glasgow—Improvements in hats and other coverings for the head.
1615. David Fisher, 12, Ranelagh-road, Thames Bank—A composition for coating metal, plates, or wheels, used for grinding, sharpening, or polishing.

Dated 9th July, 1856.

1616. William Bridges Adams, 1, Adam-street, Adelphi—Improvements in railway wheels, axles, and axle boxes.
1617. Alfred Krupp, Essen, Prussia—Improvements in the permanent way of railways.
1618. Rudolph Bodmer, 2, Thavies-inn, Holborn—Improvements in self-acting apparatus applicable to certain kinds of machines for spinning cotton and other fibrous substances. (A communication.)
1619. George Darlington, Kingston, Jamaica, and John Darlington, 36, Cannon-street, London—Improvements in the manufacture or production of zinc or spelter.
1620. Ward Holroyd and William Noble, Queen's Head, near Halifax—Improvements in machinery or apparatus for cutting wood and stone.
1621. Daniel Webster Hayden, Glasgow—Improvements in fastenings for window shutters.
1622. Timothy Jerome, 125, Great Hampton-street, Birmingham—Certain improvements in buttons for ornamenting and fastening dresses, as also in loops for attaching or holding buttons on garments while in use.
1623. Alexander William Williamson, London University, Gower-street—Improvements in obtaining the rosin and sugar of scammony.
1624. William Robertson, Manchester—Improvements in machines for spinning and doubling cotton and other fibrous substances, such machines being of the kinds commonly known as mules and twiners or doublers, and in the means of weighting rollers in the same and other machinery.
1625. Edward Wilson, 12, Eccles-street, Dublin—Improvements in pistons for steam engines driven by steam or any other elastic fluid, which improvements are also applicable to the pistons or plungers of pumps.
1626. Moss Defries, Houndsditch—Improvements in moderator and other lamps.
1627. Richard Dugdale Kay, Accrington—Improvements in machinery or apparatus for pressing, straining, sifting, or refining colours and thickened mordaunts. (A communication.)
1628. Robert Thomas Eadon, Sheffield—An improvement in the manufacture of band saws and other endless bands or hoops of metal.
1629. Henry Adcock, City-road—An improvement in casting iron and other metal.

Dated 10th July, 1856.

1630. Frederic William Russell, Aldgate, London—Improvements in the mode of coupling railway carriages.
1631. John Marsh, Nottingham, and John Catt, Stepney, Middlesex—Improvements in the manufacture of certain textile fabrics.
1632. Paul Prince, Derby—Improvements in making moulds for casting railway chairs and other articles.
1633. Samuel Hardacre, Miles Platting, Lancashire—A compound conical spike and spiral double gridded machine for opening, blowing, scutching, and cleaning cotton, wool, and other fibrous substances.
1634. Charles William Lancaster, New Bond-street—An improved method of, or apparatus for, inking, printing, or stamping surfaces. (A communication.)
1635. John Fowler, junr., Havering, Essex, and William Worby, Ipswich—Improvements in machinery for ploughing and tilling land by steam.
1636. Stephen Martin Saxby, Rock Ferry, Cheshire—Improvements in ascertaining the errors of mariners' compasses.

Dated 11th July, 1856.

1637. Robert Hutton Leadbetter, Glasgow—Improvements in the preparation of flax.
1638. Robert Harrington, Witham, Essex—Improvements in umbrellas, parasols, walking sticks, whips, &c.
1639. John Westwood, Lichfield-street, Walsall—Improvements in hand, roof, and other railway lamps, parts of which are also applicable to certain descriptions of oil lamps for general purposes.
1640. Thomas Charlton and William Turnbull, Brentwood, Essex—Improvements in steam generators.
1641. General Henri Dembinski, Rue Joubert, 8, Paris—An apparatus giving a self-acting motive power, produced by weight, elasticity, compressed water, or any gas whatever.
1642. Jean Baptiste Désiré Chevalier and Narcisse Rabouin-O'Sullivan, Paris—A new or improved method of obtaining or preparing printing surfaces, and in printing therefrom.
1643. Edward Henry Cradock Monckton, Parthenon Club, Regent-street—The application of a means or process for destroying grubs and other insects or animalculæ, or infusoria injurious to plants.
1644. Alfred Nicholson Wornum, Store-street, Bedford-square—Improvements in grand pianofortes.

Dated 12th July, 1856.

1645. Benoit Frederic Ortet, 39, Rue de l'Echiquier, Paris—A new metallic composition applicable to the coating of surfaces, and to the moulding and casting of various objects.
1646. Thomas Madely Hartwell, James William Gladwin, and Henry Gladwin, Manchester—Improvements in machinery or apparatus for stretching woven fabrics.
1647. William Bridges Adams, 1, Adam-street, Adelphi—Improvements in the permanent way of railways.
1648. John Pope, Wincheap-street, Canterbury—Improvements in the application of steam power to ploughing and other agricultural purposes.
1649. William Petrie, Woolwich—A new porous material for filters and other like articles, and for certain modifications or improvements in the manufacture of the material whereby it is adapted to the formation of vessels of capacity, to be employed as a cement, as a water and acid proof lining, as a preservative coating, and as a substitute for stone and earthenware.
1650. Abraham Herts, 22, Bunhill-row, Finsbury—Improved apparatus for holding material during the operation of sewing. (A communication.)
1651. John Avery, 32, Essex-street, Strand—An improved "plate-holder" for photographic and other purposes. (A communication.)
1652. John Rowley, Camberwell, Surrey—Improvements in the manufacture of a material as a substitute for leather.

Dated 14th July, 1856.

1653. Pierre Beauplant Rassant, Paris—A new mechanical contrivance for transforming an alternate into a continuous circular motion.
1654. Charles Burrell, St. Nicholas Works, Thetford—Improvements in arranging and rendering portable apparatus suitable for distilling from beet root and other vegetable substances. (Partly a communication.)
1655. Richard Dendy, Hornchurch, Essex—Improvements in horse-rakes.
1656. Alfred Vincent Newton, 66, Chancery-lane—An improved mode of securing the plastering of ceilings and walls.—(A communication.)
1657. William Williams, Dale, Pembrokeshire—Cutting and dressing stone by machinery.

Dated 15th July, 1856.

1659. William Edwards, Salford—An improvement or improvements in lathes, applicable also in part or on the whole to tools for boring, shaping, cutting, and screwing metals.
1660. William Clibran and Joseph Clibran, Manchester—Improvements in apparatus or mechanism for regulating and measuring gas.
1661. William Watt, Belfast—Improvements in the manufacture of starch.
1662. Evan Leigh, Manchester—Improvements in the mode or method of generating steam and applying it for the purpose of obtaining motive power. (Partly a communication.)
1663. John Knowelden, 3, South-street, Southwark-square, Southwark—Improvements in apparatus for preventing steam boiler explosions.
1665. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in apparatus for consuming smoke to be applied to lamps and gas burners. (A communication.)
1666. Charles Bell Blyth and William Parell Butchart, Dundee—Improvements in weaving.
1667. George Tomlinson Bousfield, Sussex-place, Loughborough-road, Surrey—Improvements in pumps. (A communication.)

Dated 16th July, 1856.

1671. James Ford, Preston, and Peter Knowles, Bolton-le-Moors—Improvements in machinery for cleaning and preparing cotton and other fibrous substances.
1673. Richard Morgan, Acton, Middlesex—A pocket-case for containing address cards, stamps, and other similar articles.
1677. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in circular looms. (A communication.)
1679. Adolphus Frederick Gurlt, 40, Newington-place, Kennington—Improvements in the manufacture of iron and steel.

INVENTION WITH COMPLETE SPECIFICATION FILED.

1688. Francis Barber Howell, Lebanon, Ohio, U.S.—Certain improvements in machinery for making corks. (A communication.)—18th July, 1856.

WEEKLY LIST OF PATENTS SEALED.

Sealed July 25th, 1856.

207. Alexis Jean Dessales.
213. Patrick Doran.
227. Pierre Emmanuel Guérinot.
259. James Mash.
275. George Holcroft, Joseph Smith, and Thomas Holcroft.
283. James Timmins Chance.
290. John Rock Day.
298. Ralph Waller.
322. John Inshaw.
353. William Henry Zahn and Joseph Henry George Wells.
479. Charles Isles.
495. George Parry.
497. George Tomlinson Bousfield.
897. William Smith.
933. Peter William Barlow.
948. James Nasmyth and Herbert Minton.
1003. Claude Antoine Arnaud.
1065. William Edward Newton.
1211. Charles De Jongh.

Sealed July 29th, 1856.

246. Auguste Mathieu-Maurice De Bergevin.
254. John Lee Stevens.
265. Henry Render.
272. Matthew Ker.
280. Francis Best Fawcett.
281. Henry Bestwick and Joseph Bury.
286. Charles Catherine Joubert and Leon Andre Bordier.
292. Benjamin Burleigh.
295. Alexandre Tolhausen.
314. Alexander McDougall.
332. William Kenworthy.
337. Thomas Restell.
352. Christophe Muratori.
379. Stephen Rossin Parkhurst.
390. Edouard Deiss.
392. Alexandre Tolhausen.
396. Eddlestone Elliott, Cyrus Leach, and James Ratcliffe.
456. James Griffiths.
474. Louis Normandy.
525. William Crozier.
678. John Jones and Alexander Cunningham Shirreff.
786. John Gray.
787. Alfred Vincent Newton.
922. William Westley.
1111. John Ridal.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

July 21st.

1730. Alexander Isaac Austen.
1740. James Murdoch Napier.
1748. Warren de la Rue.
1967. Benjamin Hornbuckle Hine and Anthony John Mundella, and Thos. Thompson.

July 22nd.

1733. George Spencer.
1741. Samuel Barlow and John Pendlebury.
1791. Philipp Schafer and Frederick Schafer.

July 24th.

1758. Thomas Buxton.

July 25th.

1760. Joseph Barrans.
1772. Benjamin Collins Brodie.
1827. George Fergusson Wilson and Alexander Isaac Austen.
1907. Joseph Leon Talabot and John Davie Morries Stirling.

July 26th.

1766. Peter Armand le Comte de Fontainemoreau.
1771. Thomas Forster.
1780. George Katz Douglas.
1793. John Shae Perring.
1824. Richard Brown Roden.
1935. Peter Fairbairn.
2187. Alfred Vincent Newton.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3863	July 29.	Wasteless Water-Valve and Ball-Tap Apparatus	William Devon and George Saunders	Stratford, Essex.
3864	" 29.	Water-tight Spindle Bearing	Richard Waygood	Newington Causeway.